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The Use of Bond Market Measures in
Financial Accounting Research

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The Use of Bond Market Measures in
Financial Accounting Research

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ABSTRACT

Finance literature on the determinants of bond prices and yields and the application of the CAPM to bond market returns is summarized and reviewed. The relationship of bond risk premiums to accounting information is investigated and the potential for use of bond risk premiums in accounting research is discussed.

THE USE OF BOND MARKET MEASURES IN FINANCIAL ACCOUNTING RESEARCH

I. INTRODUCTION

Financial accounting research explores the relationship between accounting information and financial market risk and return measures. Many financial accounting studies use stock market data to study such issues as market reactions to accounting information or usefulness of accounting information for predicting stock betas. Bond market measures other than bond ratings have not been widely used in corporate financial accounting research. Governmental accounting research has made more use of bond market measures because there is no equity market available. One of the reasons why corporate financial accounting research has not used bond market data more widely is that, except for bond ratings, the finance literature on bond pricing has not been made very accessible to accounting researchers. This paper surveys the finance literature on bond pricing and analyzes the potential usefulness of one bond market measure, new offering risk premiums, for accounting research.

II. ACCOUNTING STUDIES USING BOND MARKET DATA

This paper makes no attempt to survey the use of bond market measures in governmental accounting research. Ingram [1985] briefly surveys the types of studies which have been done and the bond market measures used. Likewise this paper does not discuss bond rating prediction since several excellent survey articles are available [see Kaplan and Urwitz, 1979; Altman et al., 1981; and Belkaoui, 1983]. The focus of this paper is the use of bond prices

or yields in financial accounting research. Studies to date which use bond market measures in corporate financial accounting research are reviewed below.

Several studies investigate the basic question of whether accounting information is impounded in bond market data. Davis, Boatsman and Baskin [1978] are concerned with whether bond investors incorporate the information in annual earnings announcements into bond prices. Although results for convertible debt are analogous to stock price research results, the results for straight debt do not show any association between unexpected earnings and bond returns. Ederington, Yawitz and Roberts [1984] test whether bond market participants base default risk estimates on agency ratings or financial accounting information. Their results are consistent with accounting information supplying incremental information over and above bond ratings.

Other studies are concerned with the predictive ability of various accounting disclosures relative to bond market measures of interest. Abdel-khalik, Thompson and Taylor [1978] investigate the information content of lease disclosures relative to bond risk premiums. Abdel-khalik [1981] investigates how capital leases affect charges in bond risk premiums and holding period returns. In neither study are significant associations found. Berndt, Sharp and Watkins [1979] investigate the relationship between normalized and flow-through methods of treating deferred taxes for utility rate regulation and utility bond risk. They find that utilities using normalization have lower bond yields. Finally, Reiter

[1985] finds significant associations between pension disclosures and bond risk premiums.

III. THE POTENTIAL USEFULNESS OF BOND MARKET DATA FOR RESEARCH

This section investigates issues relating to the potential for use of bond market data in financial accounting research. Evidence on the informational efficiency of the bond market is surveyed. Sources of bond market data are listed and potential problems with data availability are noted. Finally, a number of different approaches to bond risk measurement are presented.

Efficiency of the bond market

If bond market measures are to be useful in evaluating accounting information, the bond market must possess at least semi-strong informational efficiency. Frankle and Hawkins [1980-81] perform weak form tests of market efficiency which are satisfied by bond returns in their study. Alexander [1980] finds that the use of the market model for bonds involves both violations of regression assumptions and parameter instability.¹ Two other features of the bond market have been investigated in order to assess the market efficiency: the spread between new and seasoned bond issues and bond market reactions to bond rating changes.

It has been widely observed that yields on new issues differ from the yields on seasoned issues of the same firm. Several

¹. It is only fair to note at this point that while bond betas are temporally unstable by definition since they are a function of term to maturity, the same is also true of stock betas of levered firms [Weinstein, 1981].

explanations offered for this phenomena are: (1) differences in characteristics such as coupon and call terms between the new and seasoned issues explain the yield differences; (2) the seasoned market lags the new issues market due to thin trading, out of date quotes and slow dissemination of information and (3) underwriters underprice new issues to decrease marketability risk. The hypothesis of an information lag between the new and seasoned markets implies market inefficiency.

Researchers find different patterns of seasoning adjustment depending on the models and data used. Lindvall [1977], Bildersee [1977] and Shiller and Modigliani [1979] all find evidence of a one to two month lag between new and seasoned prices. These studies use yield series which may contain out of date price quotes. Ederington [1974], Weinstein [1978] and Sorensen [1982] find that the adjustment period is quite short not extending beyond the month of issue. These studies use individual bond prices. Martin and Richards [1981] find no evidence of a seasoning process in that the spread does not disappear over time. Taken as a whole the evidence does not seem to indicate that there is a serious problem of informational inefficiency in the corporate bond market. Contrary evidence is probably due to methodological problems associated with use of yield series.

Another issue which has been studied in order to evaluate the efficiency of the bond market is reaction to bond rating changes. Rating changes should not be new information in a semi-strong efficient market unless bond raters are believed to have access to

important non-public information. Katz [1974] finds no anticipation of rating changes in yield to maturity of affected bonds with full yield adjustment in the month of or month after the change. Hettenhouse and Sartoris [1976] find little effect on the yields of changed bonds with downratings fully anticipated by the date of the rating change announcement. Grier and Katz [1976] note partial anticipation of changes for industrial bonds but no anticipation for utility bonds using average price differentials between changed and control bonds. Information about the change appears to be absorbed into the price slowly but no trading rule based on the lack of anticipation leads to profits. Weinstein [1977] studies holding period returns of changed bonds and finds no return reaction within six months before or after the change announcement. Price changes 7 to 15 months prior to the announcement are noted leading to the speculation that ratings changes lag changes in company circumstances by considerable amounts of time. Schneeweis and Branch [1980-81] also find little or no significant return differential around the date of ratings change announcements.

In addition, several studies investigate stock market reaction to bond rating change announcements. Pinches and Singleton [1978] find that the information about the ratings change is fully impounded by the announcement date. The rating change lags appear to be about one and one half years for upgrades and 15 months for downgrades. Griffin and Sanvicente [1982] refine the methodology used and find that downgradings convey

information to the stock market whereas upgradings are fully anticipated.

The general conclusion seems to be that the bond market is reasonably efficient. Contradictory results between studies seem to be due to differences in methodology. It also appears that there is some reason to be wary of the accuracy of bond ratings since the rating agencies do not seem to adjust to changing circumstances in a timely fashion.

Bond Market Data Sources

One of the reasons why bond markets have not been widely used in finance or accounting studies is the lack of data resources equivalent to those available for equity markets. The institutional setup in the bond market is that the largest volume of bonds (including exchange listed bonds) are traded on the OTC market between institutional investors. No systematic records are kept of these trades. Trades on the exchanges represent transactions of individual investors and account for only about 10% of total volume traded [Boardman and McEnally, 1981]. There is thin trading in seasoned corporate issues and it is not unusual for no exchange trades for a particular issue to occur in a month. Quoted bid prices are therefore frequently out of date. This is particularly unfortunate given the volatility of bond market prices in recent years.

A number of studies use end of month price quotes from Standard & Poor's Bond Guide, Moody's Bond Record or the Bank and Quotation Record. These are quotes from bonds traded on the

exchanges and due to thin trading, the quotes are often not current or bid information is given instead of sale information. More frequent price quotes can be gathered from Barrons, the Wall Street Journal, the Weekly Bond Buyer and Salomon Brothers price lists for institutional portfolios [used by Schneeweis and Branch, 1980-81]. New issue offering yields can be obtained from the Institutional Investor, the Commercial and Financial Chronicle, the Investment Dealer's Digest, Moody's Bond Survey and Standard & Poor's CreditWeek.

Several studies use special data bases such as the Rodney L. White Center for Financial Research database of quarterly rates of return for NYSE listed bonds [Friend, Westerfield and Granito, 1978] and the Baruch College Center for Financial Research database of monthly yields to maturity for 550 utility bonds for 1966-1972 [Grier and Katz, 1976]. Gatti [1983] and Boardman and McEnally [1981] use the Merrill Lynch Municipal and Corporate Bond Computer Service where the prices represent trader's appraisals of the prices various bonds would trade for on the OTC. A proprietary matrix model is used in developing the price quotes. Ingram [1985] evaluates a similar quotation service for municipal bonds (IDS Pricing Services) and finds that returns developed from these data have suitable properties for accounting research use.

In conclusion, data availability is a problem in the use of bond market data. Thin trading in the secondary market and absence of OTC records appear to be the primary problems. Many finance studies have used available data but unfortunately little

evidence is presented about the sensitivity of results to factors such as use of out of date quotes. The existence of data bases of quotes such as the Merrill Lynch quotes or the IDS quotes evaluated by Ingram [1985] may be very helpful in providing an orderly time series of bond price quotes.

Bond Market Risk and Return Measures

Two alternative approaches are used in the finance literature for investigating risk-return relationships in the bond market. One approach views bonds as close substitutes differentiated by factors such as term to maturity, default risk, call risk and tax considerations. Yields or risk premiums are assumed to result primarily from potential price volatility, risk of default and risk of call [Gatti, 1983]. The alternative approach, which Weinstein [1981] calls a "portfolio theoretic" approach, utilizes finance models such as the CAPM in order to explain bond prices. In Section 4 studies using both yield models and CAPM models are reviewed.

Gatti [1983] demonstrates that these two approaches are indeed complementary and the same factors are found to influence bond risk and return under both types of models. Gatti shows that for a simple one period model, the yield to maturity (Y_{jt}) is a function of the expected nominal return ($[1 + E(R_{jt})]$) modified by the ratio of promised to expected future values (δ_{jt}).

$$(1) \quad 1 + Y_{jt} = \delta_{jt} [1 + E(R_{jt})]$$

Promised and expected future values differ because of risk of call

and/or default. When this expression is substituted into the single period CAPM, the following solution results:

$$(2) \quad 1 + Y_{jt} = \delta_{jt}(1 + R_f) + \delta_{jt}B_j[E(R_{mt}) - R_{ft}]$$

The implication is that promised yield is an implicit function of both source specific and systematic risk. Gatti also shows a multiperiod equivalent for (2).

There are also similarities between the yield models and the CAPM models in terms of risk of price volatility. The appropriate measure for this type of risk is duration which is the weighted average maturity of coupon and principal payments of a bond [see Gultekin and Rogalski, 1984, for a review and empirical test of various measures of duration]. Yawitz [1977], using a yield approach, models the relative price volatility of bonds as a function of duration (which measures the relationship between maturity and price volatility) and yield volatility (which is essentially a probability distribution of discount rates to be applied to the cash flows). Bond betas, as well as yields, are found to be a function of duration. Boquist, Racette and Schlarbaum [1975] develop the following expression for the bond beta based on a single period model.

$$(3) \quad B_{it} = -D_{it}\text{Cov}(d_{it}, R_{mt}) / \sigma^2(R_{mt})$$

D_{it} is the duration of bond i at time t , d_{it} is the change in yield to maturity of bond i at time t and R_{mt} is the instantaneous rate of return to holding the market portfolio at time t . Jarrow [1978] develops a similar expression for bond betas using an intertemporal CAPM model.

$$(4) \quad B_B = -DCov(dr_B, r_M) / \sigma^2(r_M)$$

Betas of bonds and price of bonds are both dependent on duration. Rao [1982] finds that the effect of yield changes on bond beta depends on the elasticity of duration with respect to yields. If beta is initially positive, it increases with increases in yields providing that duration decreases by a proportion less than the proportionate increase in yields. Jarrow [1978] asserts that bond betas should decrease over the life of the bond as duration increases. Alexander [1980] demonstrates that there is a theoretical possibility for bond betas to either increase or decrease as the bond matures. Whatever the relationship for a particular bond, note that bond betas are likely to be temporally unstable.

The expression for bond beta derived from option pricing theory [Galai and Masulis, 1976] shows that the systematic risk of debt is a positive function of the beta coefficient of the firm's real assets (B_V) and the elasticity of the market value of the debt (B) with respect to the value of those real assets (V).

$$(5) \quad B_B = \partial B / \partial V \cdot V / B \cdot B_V$$

Gatti [1983] demonstrates that equations (4) and (5) are actually identical since they are derived from the same return generating process.

Gatti [1983] concludes that there are no obvious contradictions among the various theories explaining yields of risky bonds. Yield to maturity is not solely a function of beta or systematic risk since it also depends on δ , the disparity

between promised and expected cash flows which is a function of the risk of default and call. Risk associated with price variability is a function of duration and yield volatility [Yawitz, 1977]. Bond beta is also shown to be a function of duration and the covariance of bond yield changes with the return of the market. In addition to these similarities, it can be shown that default risk is reflected in beta. The OPM model demonstrates that beta is a function of the risk of the underlying firm assets and the elasticity of the market value of debt with respect to the value of the firm's assets. The elasticity $\partial B / \partial V$ can be shown to be a function of the ratio of the value of the firm's assets to the face value of debt and term to maturity [Gatti, 1983, p.56]. Beta is inversely related to the ratio of the firm's assets to the face value of debt, a relationship which coordinates with the traditional theory of default risk. In this manner default risk is reflected in beta as well as in δ .

In summary, the same factors are shown to be important in determination of bond yields whether CAPM models or yield models are used. Section 4 reviews the results of studies using CAPM models and studies which directly model prices and yields.

IV. REVIEW OF MARKET AND YIELD MODELS

A number of studies have used market models and yield and price models to study pricing relationships in the bond market. These studies are summarized and reviewed in this section. Particular attention is paid to model composition and model

success. Various insights about the forms of the relationships between the risk and return measures are noted.

insert Table 1 here

Market Models

The results of a number of bond market model studies are summarized in Table 1. Different time periods, types of issues, data sources and market indexes are used. Most studies test the performance of stock indexes versus bond indexes versus combined indexes. The performance of the different types of indexes varies between studies. Several studies [Friend, Westerfield and Granito, 1978; Gatti, 1983] find that intercepts are too large and beta coefficients too small. Friend, Westerfield and Granito observe that residual standard deviation seems to be as important as systematic risk in explaining returns. Serious serial correlation problems are noted [Alexander, 1980; Reilly and Joehnk, 1976]. Betas are found to be unstable and sensitive to both index used and time period.

Several studies explore relationships between systematic risk measures and other risk measures. Reilly and Joehnk [1976] find a surprising positive relationship between betas and ratings (high rated bonds are also high risk) and inconsistent relationships between total risk and ratings. Weinstein [1981] finds mixed but weak relationships between beta and ratings which appear to be driven by the inclusion of speculative grade issues in the 1969-1972 time period. Gatti [1983] finds the expected inverse relationship between betas and ratings however.

Reilly and Joehnk [1976] suggest that their somewhat surprising results² are a function of the difference between long and short run holding perspectives. In the short run, such as a monthly holding period, default risk does not change very much so that it is not important in explaining short term risk. Joehnk and Nielsen [1975] analyze risk return relationships for speculative grade issues and find that higher rated issues provide lower average promised yields and have smaller variability. However, realized yields figured over a shorter time horizon during periods of unstable interest rates can show inverted risk-return relationships. A similar phenomena may be responsible for the surprising direction of correlation between beta and bond ratings in Reilly and Joehnk [1976].

Price and Yield Models

Early studies

The classic study on the determinants of bond yields is Fisher's 1959 study of risk premiums. Fisher hypothesizes that bond risk premiums are a function of the default risk of the firm and of the marketability of the bond issue. The variables used in the Fisher model are earnings variability, length of time the company has been solvent, the ratio of market value of equity to book value of debt and the market value of bonds outstanding. A log form of this model is tested on cross-sections of domestic industrial bonds in various periods spanning 25 years. The model

². Similar unexpected positive correlations between bond betas and bond ratings are found by Ingram [1985] using municipal bond data.

accounts for approximately 75% of the variation in logs of risk premiums.

Subsequent research indicates that the differential effects of capital gains (coupon) and indenture provisions (call provisions) ignored by the Fisher model are significant [Cook and Hendershott, 1978]. In addition, possible differences in risk premiums across time and across different maturities are not considered in Fisher's analysis [Silvers, 1973]. Cohan [1967] is another early study of yields in private debt placements. Other researchers at this time [such as Johnson, 1967; Frankena, 1971; Pye, 1967; and Jen and Wert, 1967, 1968] investigate the separate effects of various factors on bond yields leading to the criticism that results may derive more from the missing than the investigated factors [Cook and Hendershott, 1978]. Another problem with early studies is that yield series are often used which may have different properties than individual bond yields.

Price and yield models

insert Table 2 here

Yield models from more recent studies are summarized in Table 2. Many of these models, like Fisher's, explain yields in terms of factors such as interest rate risk, default risk, call risk and marketability risk. The models come from studies investigating such diverse issues as the effect of sinking funds, underwriting terms, call provisions, differential coupon (tax) effects and macroeconomic factors on yields. R-squares are quite high,

particularly in studies where the current level of interest rates is included as an independent variable.

Silvers [1973] and Boardman and McEnally [1981] use price models. The price of a bond is the present value of all future payments. Instead of focusing on the yield to maturity or discount rate, the Silvers approach focuses on separation of time risk and default risk factors. The model is expressed:

$$(6) \quad P_j = \sum_{t=1}^T (a_{tj}) (s_j) (C_t) + \sum_{n=1}^m b_n F_{nj}$$

where

- P_j = price of bond j ,
- a_{tj} = bond j 's default risk discount factor for time t ,
- s_j = time discount factor at time t ,
- C_{tj} = payment on bond j at time t ,
- b_n = price of factor n , $n=1, \dots, m$, and
- F_{nj} = value of factor n for bond j .

[Boardman and McEnally, 1981]

A separate time discount factor (depending on the yield curve) and a separate default risk discount factor apply to each promised payment. The factors which modify the price are the effect of call risk, capital gains and marketability. The model is solved for the implicit default risk discount factors (certainty equivalents).

Results of the models seem quite consistent with yield models and present a dynamic picture of a risk structure over time. Weights assigned to coupon payments are less than one and decrease

with time. A definite difference in patterns is noted between rating categories with higher rated bonds exhibiting greater weights. Economic conditions also appear to affect the shapes and spreads of default risk structures [Boardman and McEnally, 1981].

Factors Found Important in Explaining Bond Yields

A number of factors have been found important in explaining bond yields, risk premiums or prices. The studies summarized in Table 2 are discussed in terms of the individual factors which have been included in yield models. The factors affect prices and yields through altered expected cash flow patterns or expected discount rates or both. Theoretical relationships are explained and empirical evidence is reviewed.

Sinking funds and secured status

The presence of sinking fund provisions may reduce yield because they provide for an orderly debt service pattern, reduce the duration of the issue and increase the liquidity of the issue [Dyl and Joehnk, 1979]. However, as Ho and Singer [1984] point out, the existence of sinking funds is more prevalent in medium and low grade issues and the fact that required sinking fund installments may be acquired in the market if market prices are below call prices reduces expected payments to bondholders. Lloyd and Edmonds [1982] also point out that transactions costs, costs of refinancing retired debt and sinking fund management costs must be taken into account.

Evidence is mixed. Dyl and Joehnk [1979] and Sorensen [1982] find an inverse relationship between sinking funds and yields

while Ferri [1979], Lloyd and Edmonds [1982] and Boardman and McEnally [1981] find positive relationships.

Secured status is not included in many of these models which is surprising in view of the importance of subordinate status in explaining bond ratings. Ederington, Yawitz and Roberts [1984] and Boardman and McEnally [1981] include subordinate status and secured status variables in their models and find the expected inverse relationship between yields and secured status.

Call risk and coupon tax considerations

Most corporate issues are callable and in the future if interest rates fall, it may be to the advantage of the issuer to call the debt. This alters the expected cash flows to investors and generally investors charge some sort of call premium to compensate for call risk. Many issues have some period of protection from call or refunding with lower coupon debt and many must pay call premiums over par to redeem the debt before maturity. Empirically, the effects of call risk on bond pricing are hard to separate from coupon tax effects. Bonds selling at a discount command a lower yield because a portion of the return will be realized as long term capital gain. However, if a bond is selling at a discount is also has reduced call risk. It is difficult to determine which of these factors is reflected in the price [Shiller and Modigliani, 1979]. A number of researchers consider that call risk proxies also control for capital gain effects.

The most frequently used call risk proxies are based on the refunding rate which is the ratio of the coupon rate to the call price. The refunding rate represents the market rate below which an issuer realizes a current interest savings from refunding. Ederington, Yawitz and Marshall [1984], Ferri [1979], Gatti [1983], Boardman and McEnally [1981], Sorensen [1982] and Silvers [1973] all use call risk variables based on the refunding rate. Berndt, Sharp and Watkins [1979] use coupon rate. Type of protection (call vs refunding) and period of call protection are also used by Ferri [1979], Ederington, Yawitz and Roberts [1984], Lloyd and Edmonds [1982], Gatti [1983] and Sorensen [1982]. A simple call risk measure based on expected rates impounded in the yield curve is used by Cook and Hendershott [1978] and a more complex call risk measure based in interest rate expectations is developed by Yawitz and Marshall [1981].

Call risk variables are generally significant. Martin and Richards [1981] find that the entire new - seasoned issue spread is explained by coupon and call deferment differences. Period of call protections is not found significant in several studies. Boardman and McEnally [1981] find that call risk factors are not important in the lower rating classes.

Term to maturity

Ederington, Yawitz and Roberts [1984] adjust yields for the shape of the yield curve. Other studies proxy for interest rate risk by including term to maturity (often in log form) in their models. Term to maturity is generally significant [Fabozzi and

West, 1981; Ferri, 1979; Lloyd and Edmonds, 1982; and Katz, 1974]. Since term to maturity is included to control for interest rate risk, it may seem that duration, the average maturity of principal and interest payments of a bond, would be a more appropriate measure. As explained by Gultekin and Rogalski [1984] each measure of duration only explains price volatility given a particular pattern of yield curves and changes in yield curves. While particular duration measures offer a more satisfactory fit in different time periods, none is superior to simple maturity as an overall measure.

Other factors

Van Horne [1978] finds that there appears to be a tendency for risk premiums to vary with the business cycle. This is due in part to changing investor attitudes toward risk and in part to changing perceptions of the risk potentials of firms. Jaffee [1975], Cook and Hendershott [1978], Yawitz and Marshall [1981] and Berndt, Sharp and Watkins [1979] all include various macroeconomic indicators in their models. The index of consumer sentiment is found to be consistently highly associated with yield levels.

Fisher [1959] includes a proxy for marketability which is significant in his model. Other studies [Silvers, 1973; Cook and Hendershott, 1978; Gatti, 1983; Katz, 1974; and Berndt, Sharp and Watkins, 1979] do not find marketability measures to be important. Fabozzi and West [1981] include variables relating to the effect of negotiated versus competitive bids on initial offering yields.

They find that the effect of underwriting terms is dependent on the intensity of bidding and overall market conditions. Competitive bidding generally lowers interest costs but in times of market instability, negotiated underwriting can be cheaper.

In summary, models may explain yields, risk premiums or bond prices. Factors which should be taken into account include indenture terms (ie. sinking fund, secured status and call provisions), coupon tax effects, call risk, term to maturity and macroeconomic factors.

V. RISK PREMIUM MODEL

The purpose of this section is to test the association of accounting information with risk premiums of new issue bonds. In addition, the properties of the risk premium and its suitability for use in research as a measure of bond risk are examined. Utility new issues from 1980 to 1983 are used as the sample.

The hypothesis of the study is that accounting information increases the explanatory power of the risk premium model. The hypothesis can be stated in null form:

Ho: The addition of the accounting variables to the control model does not increase the explanatory power of the model.

Determinants of the Risk Premium

The risk premium on corporate bonds can be defined as the difference between the yield on a risky security and that on a security that is risk-free but identical in all other respects [Van Horne, 1979]. The risk premium cannot be observed empirically because it is not possible to find risky and risk-free securities

identical in all respects but risk. The risk premium is commonly measured by the difference between the yield on a corporate bond and a U.S. Treasury bond of similar maturity. However, there are other differences between corporate bonds and U.S. Treasury bonds in addition to risk. Differences in call characteristics, coupon and marketability explain part of the yield differential between a corporate and Treasury bond.

Measurement of the Dependent Variable

The dependent variable (DYIELD) is formed by subtracting the yield to maturity of a U.S. Treasury issue from the offering yield (OFYLD) of a new utility issue. Conversations with investment bankers indicate that the offering yield on a new issue is set as a risk premium over the yield on the most recent issue Treasury bond of similar maturity at a particular point in time. Treasury yields are quite volative so that even though the offering date is known, the precise Treasury yield used to determine the offering yield cannot be determined. Treasury bond yields are taken from the Wall Street Journal which reports a figure representative of yields during the day.

Since corporate and Treasury bond issues are not sold to yield the same amount, coupons will always be different. This can lead to two types of distortion in the measurement of the risk premium: incomplete control for interest rate risk and bias due to coupon tax effects. Since both the utility and recent issue Treasury bonds used to form the risk premium in this study have coupon levels close to yields to maturity, the durations of both

types of issue should bear a stable relationship to maturity. Therefore interest rate risk is controlled for by matching by maturity.

Differential coupon rates also have tax implications since a large part of the return on a discount bond may be realized as long term capital gain. If the Treasury bond used to form the risk premium is selling at a discount, the coupon tax effect will affect the risk premium. Forming the risk premium using the yield of the most recent Treasury issue of similar maturity protects against bias from coupon tax effects since the Treasury bonds are not yet trading at large discounts.³

Independent Variables

The variable number of years to maturity (MATYR) is included in the model. Other issue characteristics which must be controlled for are first mortgage status (MTGE) and presence of a sinking fund agreement (SF). Several variables are included to control for political and regulatory factors particularly associated with utilities.

The long term U.S. Treasury bonds used to form the risk premium are callable only in the last five years of their term. The call provision is deferred so far into the future that it is unlikely to have much impact on the new issue risk premium.

³. Tax-adjusted U.S. Treasury yields are formed in a process adapted from Cook and Hendershott [1978]. When the model is estimated using risk premiums computed with tax-adjusted Treasury yields, results are similar to results of the risk premium model using unadjusted Treasury yields in terms of adjusted R-squares, signs and significance of coefficients and correlation of actual and predicted risk premiums.

Differences in call provision between the utility bonds will affect their relative yields. The period of the study, from 1981 through 1983, is a period of relatively high interest rates. The call provisions of bonds issued during high interest rate periods should be particularly important as future refinancing at lower future rates seems probable.

Several variables are included to control for differential call risk. CALLF (0,1) indicates at least some (usually five years) call protection. RFF (0,1) indicates some term of protection against refunding with lower coupon debt (again usually five years). PER is the number of interest periods (semi-annual) of call or refunding protection. One measure of the magnitude of the call premium DFYLD is the difference between the yield to the end of call or refunding protection (YLDFC) and the offering yield (OFYLD). In periods of high interest rates it seems reasonable to presume that firms will take advantage of call or refunding opportunities at the first possible moment if interest rates have come down and YLDFC is figured using the call premium which would be in effect at that point in time. In addition, two proxies for call risk, Y and K, developed by Yawitz and Marshall [1981] are adapted for use in the model. Y represents the increase in coupon necessary as compensation to the investor for a loss at time of call or refunding. This potential loss is measured by the difference between the bond price at the call date based on the interest rate expectations implicit in the yield curve at time of issue and the par value of the bond. K represents the increase in

coupon necessary as compensation for a dollar loss at time of call or refunding.

Risk premiums vary with the business cycle so that the index of consumer sentiment (MOOD), which is found to be a good measure of cyclical default risk changes by Jaffee [1975] and Yawitz and Marshall [1981], is included in the model. TYIELD, the unadjusted U.S. Treasury bond yield for the most recent issue of similar maturity is also included as an independent variable since the risk premium is not constant over changing interest levels. As Cook and Hendershott [1978] note the risk premium rises with rising interest rates in an approximately linearly fashion.

The role of the accounting variables in this model is to represent the default risk position of the firm. Since the sample used is utility issues, the financial ratios must be specifically related to utility analysis. Sources for the development of the financial variables include Standard & Poor's Rating Guide [1979], Melicher's [1974] factor analysis of utility ratios and Altman and Katz's [1976] bond rating prediction study using a utility sample.

The financial variables chosen for use in this study cover the categories of factors found to be important in previous studies: cash flow adequacy, asset protection, capitalization, size and earnings stability. The financial variables included in the control model (designated by R_---) are all adjusted for industry effects and represent the position of the firm relative to the industry group median for each financial variable.

Table 3 summarizes the risk premium model variables and expected signs.

insert Table 3 here

Sample and Estimation

The sample consists of new public issues of utility bonds between February 23, 1981 and February 29, 1984. The offering date, offering yield and other terms of each issue, including indenture terms, are gathered from Moody's Bond Survey, The Investment Dealer's Digest, and Moody's Public Utility Manual. Descriptive information necessary to code the NUKE and REG variables comes from Standard & Poor's CreditWeek analysis of new issues. Treasury yield used for TYIELD and Y and K are from the Wall Street Journal.

The primary source for financial variables is Standard & Poor's CreditWeek and secondary sources are annual reports and Moody's Public Utility Manual. Data sources for the ratios of firms used as the industry indexes are the same as listed above. The final sample consists of 282 issues.

Estimation

The risk premium model is estimated using ordinary least squares (OLS). Dummy variables representing year and industry are found significant and included in the model. The null hypothesis of normality for both the dependent variable and the residuals is not rejected using the Kolomogorov D test [Stevens, 1974] and the null hypothesis of homoscedasticity is not rejected using the Goldfeld-Quandt test [Goldfeld and Quandt, 1965]. Examination of

residual plot and Durbin-Watson tests does not indicate any problem with serial correlation. Systematic dependencies among the residuals might result if the model were not well specified due to the multiple issues contained in the sample for many firms. Pairs of residuals from issues of the same firm are formed and sign tests and simple correlations indicate that systematic relationships among these residuals are not a serious problem.

About two-thirds of the risk premium is explained by the full model (including financial variables). Three quarters of the variables have the expected sign and more than half of the variables are significantly different from zero. Results for the full and reduced (control) models are presented in Table 4.

insert Table 4 here

Several variables do not have the expected sign or are not significant in either model. These include sinking fund (SF), call protection (CALLF), period of call protection (PER), call premium proxies (Y,K), relative property funding ratio (RPROP), relative debt to equity ratio (RDE) and relative return on equity (RROE). One factor which must be considered in explaining lack of significance and unexpected signs is the presence of collinear relationships in the sample. Analysis of the model by the procedure specified in Belsley, Kuh and Welsch [1980] show that several dimensions of mild to strong collinearity do occur in the sample. CALLF is collinear with RFF; PER is collinear with Y and K; and RPROP and RDE are highly collinear.

The most reasonable explanation for the "wrong" sign for sinking fund (SF) is that only firms with high default risk are forced to offer sinking fund provisions in order to market their bond issues. Y and K appear to proxy for relationships between maturity, call protection periods and current interest rate levels. Small values of K are associated with long maturities and high levels of current interest rates - both of these factors are directly related to DYIELD.

The overall conclusion is that the model is well specified. OLS assumptions are met, a reasonable portion of the variance is explained by the model and the performance of the variables included in the model generally conforms with prior expectations. The risk premium is statistically well-behaved and is a promising bond risk measure for future accounting research.

Results

The null hypothesis in this study is that the model which includes the financial variables (the full model) has no more explanatory power than the model without financial variables (the reduced model). The statistical test used is a general linear test [Neter and Wasserman, 1974]. The calculated F ratio of 17.91 is highly significant and allows rejection of the null hypothesis. Accounting measures of financial condition are associated with bond risk premiums.

One further consideration is the relationship between bond risk premiums and bond ratings. The simple correlation between the two measures is $-.336$. This is the expected sign but does not

indicate as strong a relationship as might be expected. Bond ratings are purely measures of default risk of individual firms. Risk premiums are also influenced by a number of other factors such as call risk, indenture characteristics, level of interest rates and position in the business cycle. DYIELD is regressed on several of these factors (MTGE, CALLF, RFF, PER, DFYLD, Y, K, MOOD, TYIELD, YR1 and YR2) and the residual from this regression is correlated with bond ratings. The correlation coefficient is $-.656$ which indicates a strong relationship between these two bond risk measures.

Several problems with bond ratings are that they are a discrete rather than a continuous variable. This leads to a number of statistical problems with bond rating models. The intervals between rating classes are not well understood. Rating models have difficulty discriminating between adjacent categories. In addition, there is strong suspicion that ratings are not upgraded on a timely basis and differences in rating between the major rating firms are often noted [Kaplan and Urwitz, 1979]. All these problems are avoided by the use of alternative default risk measures such as risk premiums. Given the strong correlation between the measures, risk premiums may be a useful substitute measure of default risk with fewer statistical problems than bond ratings.

VI. CONCLUSION

This paper investigates the usefulness of bond market data for accounting research. Accounting studies using bond market

data are reviewed. Evidence about the efficiency of the bond market, data availability and theoretical bond market risk and return relationships is presented. Studies using both market models and yield and price models are summarized. Evidence about factors found important for bond yields is presented. Finally, new offering risk premiums are investigated in terms of association with accounting information and potential suitability for research in accounting. Risk premiums are found to be highly associated with accounting information and highly correlated with bond ratings. The use of risk premiums instead of bond ratings in accounting research avoids certain problems associated with bond rating use.

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Table 1 Bond Market Model Studies

Author(s)	Sample and data	Indexes	Representative betas	R squares	Comments
Alexander [1980]	1967-72 26 industrials 47 utilities Monthly	CRSP value weighted with dividends Long-term corporate bond index Combination stock and bond index - weighted by aggregate market values	Stock - .22 Bond - .78 Combo - .37	11.46 43.82 19.14	Strongest relationship with debt index but problems with serial correlation and non-normal residuals. Considerable parameter instability.
Davis, Boatsman & Baskin [1978]	1968-72 Biweekly	Use principal component vector scores associated with market factor in factor analysis			Abnormal returns not correlated with unexpected earnings. Model estimated with one degree of lag
Friend, Westerfield & Granito [1978]	1968-73 NYSE listed Quarterly	Equal-weighted quarterly index based on sample NYSE composite index Combination of corporate bond, stock and US Government bond indexes	Stock - -.018 Bond - .001 Combo - -.016	.087 -.001 .209	Analysis is also run using grouping techniques.
Gatti [1983]	1973-77 587 bonds Monthly	Combined S & P 500 stock index and Salomon Brothers High Grade bond index	.006	.06	Uses Merrill Lynch prices. Beta function for duration, ratings and industry gives R-square of 40.7.
Reilly & Joehnk [1976]	1967-72 26 industrials 47 utilities Monthly	Moody's Average Corp. Bond Yield Series " " lagged one month Moody's Bond Yield Series by corporate group and rating S & P Composite Price Index Moody's Average Corporate Index	Ave. bond - 1.13 Own rating .89	51.4 57.7	Returns formed using yields. Quite a bit of autocorrelation. Betas not inversely associated with ratings as expected.
Weinstein [1981]	1962-74 Monthly	CRSP Value-weighted NYSE index with dividends Long-term Corporate Bond Index Combined bond and stock	.051 - .301 Combined	10.8 - 11.6	Regressions of beta on term to maturity and coupon are significant, no consistent relationship between beta and ratings or yield spreads found.

Table 2 Yield and Price Studies

Author(s)	Sample and data	Special features and Comments	Dependent variable	Factors represented by independent variables	R Squares
Berndt, Sharp, Watkins [1979]	1962-76 Electric Utilities 90-95	Pooled cross-section time series	Tax Adjusted Yields	Debt to equity(\$), Current assets, Coupon (\$), Exchange listing, Rate normalization(\$), Change in money supply, Change in GNP growth(\$), Market power, Location	.85 for 1972-76
Boardman & McEnally [1981]	1972-75 515 Corporates	Separate regressions by rating classes Mixed results on most independent variables	Price	Certainty equivalents(\$), Call, Sinking fund, Secured status, Exchange listing, Industry dummies(\$), Bond beta	.89-.99
Cook & Hendershott [1978]	1961-75 Yield series Utility Aa	Risk premium is difference between utility and tax-adjusted govt. yield series	Risk premium	Index of consumer sentiment(\$), Employment index, Call(\$), Level of interest rates(\$), Relative supply	.46
Ederington, Yawitz & Roberts [1984]	2/27-3/1/79 176 Corporates	Tests financial ratios versus bond ratings Nonlinear estimation of financial ratios	Yield	Financial ratios(\$), Bond ratings(\$), Subordinate status(\$), Call and capital gain(\$), Period of call protection	.818 for Ratios .799 for Ratings
Fabozzi & West [1981]	1974-76 236 Utilities	Testing underwriting differences on new issues	Overall interest cost	Level of interest rates(\$), Ratings(\$), Term to maturity(\$), Offering terms	.82
Ferri [1979]	1976 New issues	Testing call provisions	Yield	Call(\$), Term to maturity (ln), Ratings(\$), Quarter of issue, Call deferment period(NS), Type of call protection(\$), Sinking fund(\$)	.89-.94
Fisher [1959]	1927,1932, 1937,1949 1953 45-88 firms	Model estimated in log form	Risk premium	Earnings variability(\$), Period of solvency(\$), Equity to debt ratio(\$), Marketability(bonds outstanding)(\$)	.73-.81
Gatti [1983]	1973-77 587 bonds	Uses Merrill Lynch data	Yield	Bond beta(\$), Term of call protection(\$), Call premium(\$), Ratings(\$), Volume	.365
Jaffee [1975]	1954-69 Quarterly	Uses Moody's yield series to investigate cyclical yield spreads	Risk spreads between ratings	Index of consumer sentiment(\$), Unemployment rate, Growth rate of retained earnings(\$), Growth of capital investment(\$), Growth of output, Baa interest level(\$)	.65-.75
Katz [1974]	1966-72 Electric utilities	Separate regressions each month. Most models significant	Yield	Term to maturity(\$), Total float, Coupon(\$)	
Lloyd & Edmonds [1982]	1977-79 207 new issues	Investigating impact of sinking fund	Offering yield	Coupon(\$), Term to maturity(\$), Sinking fund(\$), Type of call protection(\$), Call deferment period	.947

* indicates significant coefficient

Table 2 Yield and Price Studies

Silvers [1973]	1952-64 50 - 100 Monthly	Separate regressions by ratings. Estimated using Almon lag	Price	Certainty equivalents(\$), Marketability risk, Call and capital gain risk(\$)	.92-.97 for AAA .53-.88 for BBB
Sorensen [1982]	1974-80 880 new issues		Yield	Level of interest rates(\$), Change in interest rates, Supply(\$), Sinking fund(\$), Issue size, Ratings(\$), Period of call protection(\$), Call protection(\$), Interaction of call protection and period of call protection(\$)	.97-.98

TABLE 3

Risk Premium Model

Variable	Expected Sign	Description
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Dependent Variable

DYIELD		Risk premium
--------	--	--------------

Maturity and Issue Characteristics

MATYR	+	Years to maturity
SF	-	Sinking fund
MTGE	-	First mortgage

Political and Regulatory Factors

NUKE1	+	Involvement with nuclear plant
NUKE2	+	Trouble with nuclear Plant
REG1	+	Regulatory cooperation necessary
REG2	+	Regulatory cooperation vital

Call Risk

CALLF	+	Call protection
RFF	+	Refunding protection
PER	-	Periods of call or refunding protection
DFYLD	-	Offering yield - Yield to first call
Y, K	+	Call premium proxies

Macroeconomic Factors

MOOD	-	Index of consumer sentiment
TYIELD	+	Level of Treasury yields

Financial Variables (All industry adjusted)

RCONST	-	Cash flow to construction expenditure
RPROP	+	Property funding ratio
RDE	+	Debt-equity ratio
RSIZE	-	Permanent capitalization
RROE	+	Coefficient of variation of return on equity
RCOV	-	Pretax interest coverage

TABLE 4

Regression Results
N=282, Dependent variable - DYIELD
Reduced Model Full Model

Variable	Pre- dicted sign	Coeffi- cient	Std Error	Coeffi- cient	Std Error
Intercept		1.620	1.093	2.840	1.037*
MATYR	+	.002	.007	.012	.006*
SF	-	.164	.078*	.207	.069*
MTGE	-	-.220	.136*	-.349	.131*
NUKE1	+	.209	.121*	.093	.112
NUKE2	+	.455	.141*	.309	.130*
REG1	+	.245	.093*	.058	.087*
REG2	+	.761	.233*	.426	.207*
CALLF	+	.287	.359	.543	.321*
RFF	+	.638	.359*	.788	.321*
PER	-	.004	.013	.001	.011
DFYLD	-	-.286	.101*	-.271	.091*
Y	+	-2.290	.918*	-1.231	.837
K	+	-27.274	5.190*	-24.089	4.614*
MOOD	-	-.020	.008*	-.024	.007*
TYIELD	+	.147	.039*	.146	.034*
YR1		.667	.206*	.646	.184*
YR2		.271	.202	.318	.178
IND1		-.179	.177	.053	.179
IND2		-.449	.185*	-.333	.175
RCONST	-			-.247	.083*
RPROP	+			-.023	.285
RDE	+			-.062	.312
RSIZE	-			-.078	.040*
RROE	+			.042	.039
RCOV	-			-1.004	.156*
Adjusted R-Square		54.88		65.76	
F Statistic**				17.91	

* Significantly different from 0 at the 5% level.

** The F statistics are from general linear tests of differential explanatory power of the full models over the reduced model (without pension variables). F* at a significance level of 5% is approximately 2.65.

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